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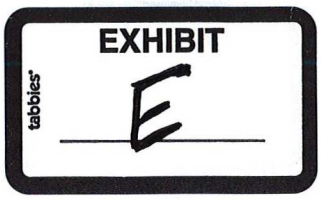
Forensic Failure Engineering and Scientific Consulting (FFESC), LLC

Anderson v Wal-Mart



Anderson v Wal-Mart

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Introduction

At the request of Gunderson, Palmer, Nelson, Ashmore, LLP, Forensic Failure Engineering and Scientific Consulting, LLC (FFESC), investigated an incident involving Ms. Ruby Anderson, who resides at 1913 Morningside Drive, in Brookings, South Dakota. The incident allegedly occurred while Mr. Anderson was driving her 1999 Dodge Ram 1500 4WD pickup truck, when the left front wheel and tire reportedly detached from the vehicle. The incident allegedly caused injuries to Ms. Anderson. The purpose of FFESC's investigation was to evaluate and document the wheel and tire that reportedly detached from Ms. Anderson's truck, and to evaluate any factors that could have contributed to the alleged incident.

Qualifications

I am a Principal at Forensic Failure Engineering and Scientific Consulting, LLC (FFESC), where I specialize in engineering analysis of structural, dynamic, and materials issues, with specific expertise and experience investigating mechanical engineering system, material behavior, as well as product design and various system issues. I make extensive use of finite element modeling to evaluate structural, thermal, and fluid behavior. I have a Bachelor of Science in Mechanical Engineering and a Master of Science in Materials Science and Engineering, both from the Arizona State University. I served as a Chairman of the Arizona Chapter for American Society of Materials International, responsible for providing information to the public related to structural and materials issues. In addition, I peer reviewed scientific papers for various journals and societies including the Journal of Testing and Evaluation and the Society of Automotive Engineers. I served on the American Society of Mechanical Engineers Committee for High Pressure Piping Code B31.3, where I was responsible for design, safety, testing requirements, and material selection for ultra-high purity high-pressure systems.

Attached, as Appendix A, is a true and correct copy of my curriculum vitae. I am over 18 years of age. A list of cases in which I have provided expert testimony over the past 5 years is attached as Appendix B. FFESC currently charges $300 per hour for my consulting services.

My opinions in this matter are based upon the following and are to a reasonable, or higher, degree of scientific certainty and/or probability:

1) My education, training, and experience.

2) My evaluation of the Anderson case material supplied to me to date.

3) My review of the surveillance video of the services performed on two vehicles at the subject Wal-Mart store. One of the two vehicles in the video reportedly is Ms. Anderson's truck.

4) My inspection and testing of the wheel and tire that allegedly separated from Ms. Anderson's truck.

5) The information gathered to date.

I may have supplemental opinions after further discovery process provides additional details about the allegations and the foundations upon which the Plaintiff based their allegations.

Background

According to Ms. Anderson's testimony, on December 14, 2014, she was driving her 1999 Dodge 1500 4WD pickup truck (subject truck), when the left front wheel reportedly detached from the vehicle. During the wheel detachment incident Ms. Anderson was able to keep the vehicle on the road without getting into an accident or hitting an object. She stated that as the result of the left front wheel detachment the subject truck "*tipped to the left*", which caused her to hit her head and shoulder against the driver's door glass. The impact against the glass allegedly caused injuries to Ms. Anderson. Based on the images produced, the most significant damage observed on the subject truck is an abraded left front rotor disk. Ms. Anderson testified that immediately after the incident she called 911 and the dispatcher sent the tow truck, which towed her vehicle from the scene. Based on the Wal-Mart incident report dated December 14, 2014, Ms. Anderson visited the subject store to report the wheel detachment incident.

According to the documents reviewed to date, on December 7, 2014, Ms. Anderson took the subject truck to Wal-Mart for a tire service. Ms. Anderson testified that the right front tire had a bubble in it and that this was the reason she took the vehicle to Wal-Mart. Based on the Wal-Mart's invoice dated December 7, 2014, Ms. Anderson purchased one tire on that day. The purchased tire size was 265/75R16, which is consistent with the original equipment manufacturer (OEM) tire size for the four-wheel drive (4WD) 1999 Dodge 1500 pickup truck. The purchased tire is 265 millimeters (10.43 inches) wide. The tire size designation also indicates that the tire sidewall height is 75% of the tire width, which results in the tire sidewall height 7.82 inches. This results in the overall tire and wheel assembly diameter of 31.65 inches, and a circumference of 99.43 inches.

Based on the testimony of Mr. Jeff Perleberg, who worked at the subject Wal-Mart store and serviced Ms. Anderson's vehicle, the service was initially going to include only replacing the right front tire with the spare tire and wheel. However, since the tread depth was significantly different between the undamaged left front tire and the spare tire (the spare tire had significantly deeper tread than the left front tire, which can result in damage to various vehicle components), it was concluded that a new tire needed to be installed on the right front wheel to approximately match the tread depth of the spare tire. Because of these considerations, Ms. Anderson was informed that she needed to purchase at least one tire, which she reportedly accepted. Consequently, the new tire was reportedly installed on the right front, while the spare tire was installed on the left front.

According to Ms. Anderson, after the subject truck was serviced at Wal-Mart, she did not drive the truck until the day of the incident. She stated that she drove her other vehicle, Dodge Neon. She also testified that immediately after the incident she could not find the detached wheel, and that it was not until the next day that the detached wheel was found in the area where the incident occurred.

Review of Relevant Documents

Wal-Mart Invoice

An invoice generated by Wal-Mart on December 7, 2014, the date it serviced Ms. Anderson's truck, indicates that Ms. Anderson purchased one tire of the following size: 265/75R16. The invoice also recorded the passenger front tire DOT number as 5W6W 00AA 1214, which indicates that the purchased tire was manufactured in the 12th week of 2014. The invoice also indicates that the valve stem was serviced on the passenger front tire, which is consistent with the installation of the new tire on the right front. According to the invoice, all four tires had tire pressures adjusted to 35 pounds per square inch (psi), while the lug nut installation torque was 100 foot-pounds (lb-ft). It should be added that, according to the testimony of Wal-Mart employees Mr. Jeff Perleberg and Mr. Joey Patek, Wal-Mart's standard procedure is to tighten the lug nuts three times before releasing the vehicle to the customer. Mr. Perleberg and Mr. Patek described that after the wheel installation lug nut torqueing, the vehicle is taken outside and driven in a figure eight, which is then followed by another lug nut torqueing. Subsequently, the vehicle is taken outside and driven in a figure eight again, which is followed by another lug nut torqueing sequence. This means that the lug nuts at the subject Wal-Mart store are torqued three (3) times in total before the vehicle is released to the customer.

Wal-Mart Incident Report

Wal-Mart incident report dated December 14, 2014, contains Ms. Anderson's statement regarding the incident. She stated in the incident report the following: "*couple seconds before tire fell off we heard a loud thud noice* [sic] *then slowed & tire rolled passed us on interstate going about 70.*" Ms. Anderson listed Ashley Henriquez and Jamie Henriquez as witnesses to the incident since they were with her in the truck. There are no reports that Ashley or Jamie sustained injuries during the incident.

Joey Patek Witness Statement

According to the Wal-Mart witness statement dated December 14, 2014, which was completed by Mr. Joey Patek who worked at the subject Wal-Mart store, Ms. Anderson reported that the tow truck driver told her that the studs on the subject truck appeared stripped. Mr. Patek also reported

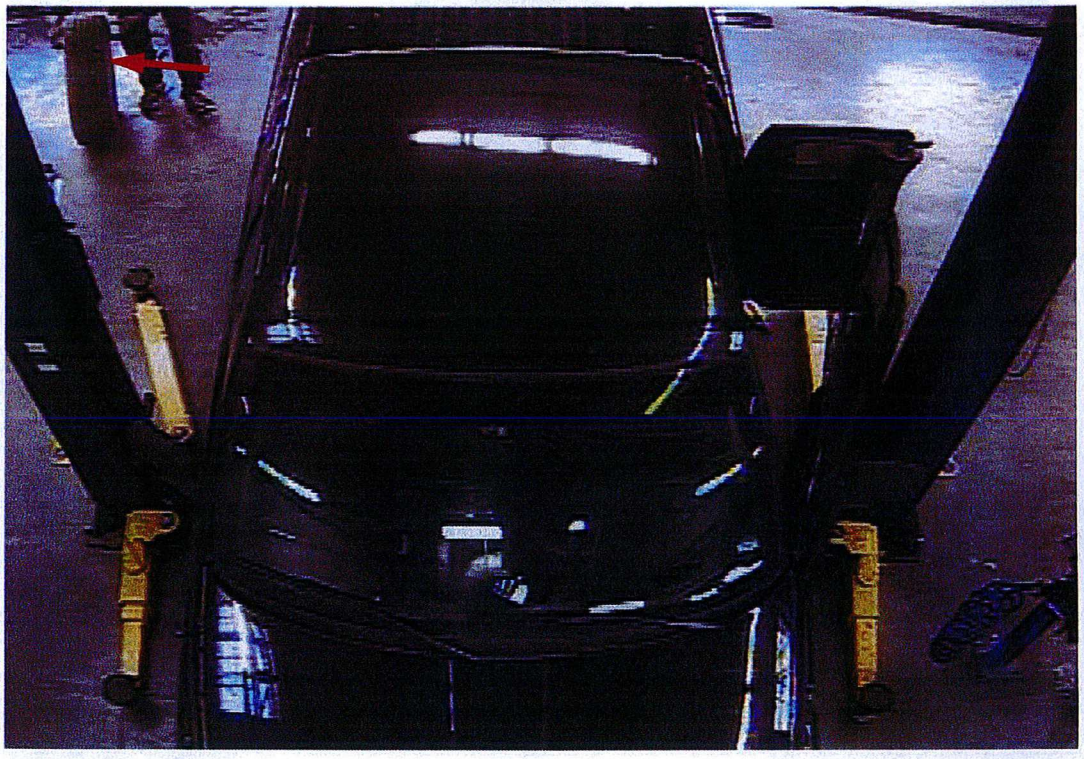
speaking to "*the customer*" at 3PM on that day, at which point they informed him that they found the detached tire.

Review of the Wal-Mart Surveillance Video

Wal-Mart surveillance video shows the service performed on the subject vehicle, as well as the service performed on another vehicle (a red Chevrolet pickup truck) before the subject vehicle was serviced. The video review revealed several significant findings:

1. Wal-Mart lug nut tightening procedure:
    a. Wal-Mart personnel performed lug nut torqueing three times on the red Chevrolet pickup truck that was serviced before the subject Dodge pickup truck.
    b. Wal-Mart personnel also torqued the lug nuts three times on the subject Dodge pickup truck.
    c. Both of these observations are consistent with Mr. Perleberg's and Mr. Patek's testimony.
2. 02:41:46 – Wal-Mart employees can be seen working underneath the rear end of the subject vehicle, at the location where the spare tire is located:
    a. The actions of the Wal-Mart employees are consistent with the removal of the spare tire.
    b. 02:43:49 – A tire that was subsequently rolled towards the front of the subject vehicle and outside the camera view, has four (4) distinct rain grooves (circumferential channels), and appears to be bulging slightly over the rim, Figure 1.
    c. The wheel on which the four-groove tire is installed appears to be gray or dull silver in color.
    d. No visible oxidation or discoloration consistent with steel oxidation was observed on the wheel rolled from the back of the truck.

Digital Video Snapshot
Site: STORE1500
Camera Name: TLE OVERVIEW 03
12/7/2014 2:43:49 PM (Central Standard Time)

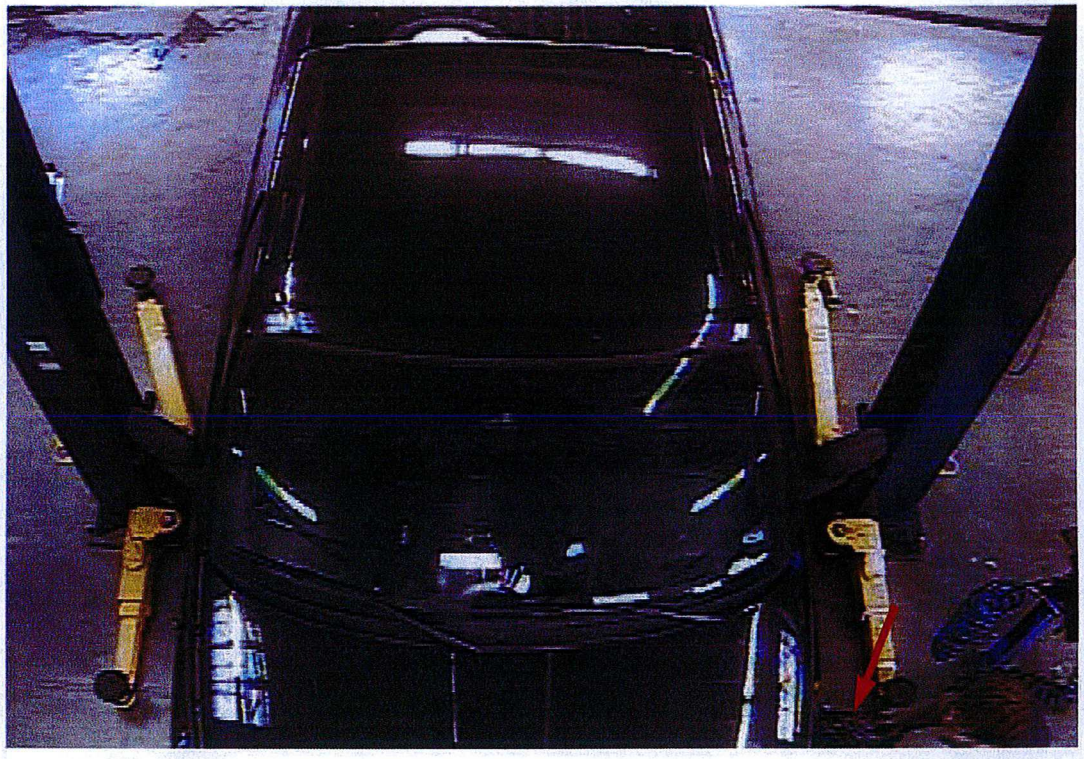


Capture Size: 704 x 480 pixels
Device Network Name: DVR03S01500US
Device Serial Number: GS1249B604

Figure 1. The tire that was rolled from the back of the truck has four (4) distinct circumferential rain grooves.

3. 02:48:40 – Wal-Mart employee placed a tire mounted to a wheel into the cargo bed of the subject vehicle.
    a. The appearance of the wheel is consistent with a Dodge pickup truck OE wheel.
    b. A circumferential longitudinal rain groove was observed along the edge (shoulder) of the tire mounted on the wheel placed into the cargo bed.
4. 02:52:59 – Wal-Mart employee mounted the left front tire (Figure 2):
    a. The mounted tire was observed to have four (4) distinct circumferential rain grooves.

Digital Video Snapshot
Site: STORE1500
Camera Name: TLE OVERVIEW 03
12/7/2014 2:52:59 PM (Central Standard Time)



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Device Serial Number: GS1249B604

Figure 2. The tire that was installed on the left front has four (4) distinct circumferential rain grooves.

5. 03:01:24 – The subject vehicle is being taken out of the service bay.
    a. The left front tire left a trace on the concrete floor, Figure 3.
        i. Four distinct channels can be observed in the tire trace pattern.
        ii. The edge of the tire trace is consisted of distinct tread blocks (patches), i.e. not a solid tire shoulder.

Digital Video Snapshot
Site: STORE1500
Camera Name: TLE OVERVIEW 03
12/7/2014 3:01:24 PM (Central Standard Time)

Capture Size: 704 x 480 pixels
Device Network Name: DVR03S01500US
Device Serial Number: GS1249B604

Figure 3. The track left by the left front tire as the vehicle was reversed out of the bay has four (4) distinct grooves and shoulder blocks separated by the transverse grooves.

The following can be concluded based on the information observed in the Wal-Mart surveillance video:

1. Based on the lug nut tightening performed on both vehicles in the surveillance video, Wal-Mart follows a distinct procedure, which results in the lug nuts being tightened three times before the vehicle is released to the customer.

2. Although the video does not show the spare tire removal, based on the actions and testimony of Wal-Mart personnel, the tire that was rolled towards the front of the vehicle is the spare tire from the subject Dodge truck.

3. Wal-Mart tightened the lug nuts on the front left of the subject vehicle three times. This is consistent with the testimony of Mr. Perleberg and Mr. Patek regarding the Wal-Mart's lug nut tightening protocol.
4. Based on its appearance, the spare tire has four (4) distinct circumferential rain grooves.
5. Based on the tire appearance and the tire trace, the shoulder on the Wal-Mart installed left front tire is not solid but is consisted of tread blocks separated by the transverse grooves.

Inspection of the Produced Wheel and Tire

On May 23, 2017, FFESC inspected the tire and wheel that reportedly detached from the subject truck. The front of the inspected wheel is shown in Figure 4, while the rear side of the wheel is shown in Figure 5. The inspected wheel is a five-lug steel wheel. The wheel exhibited corrosion and scaling on both the rear and the front. However, the rear side appears significantly more corroded than the front side of the wheel. The inspected tire virtually did not exhibit any bulging over the rim.

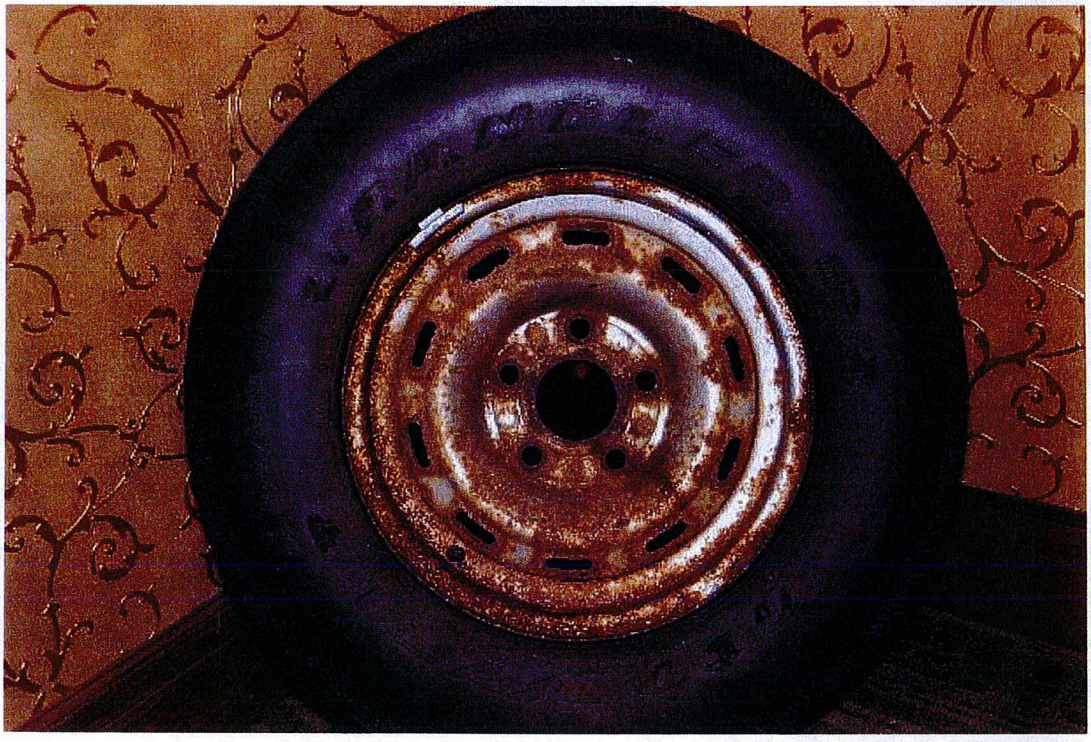

Figure 4. Front side of the wheel and tire that reportedly detached from the subject vehicle.

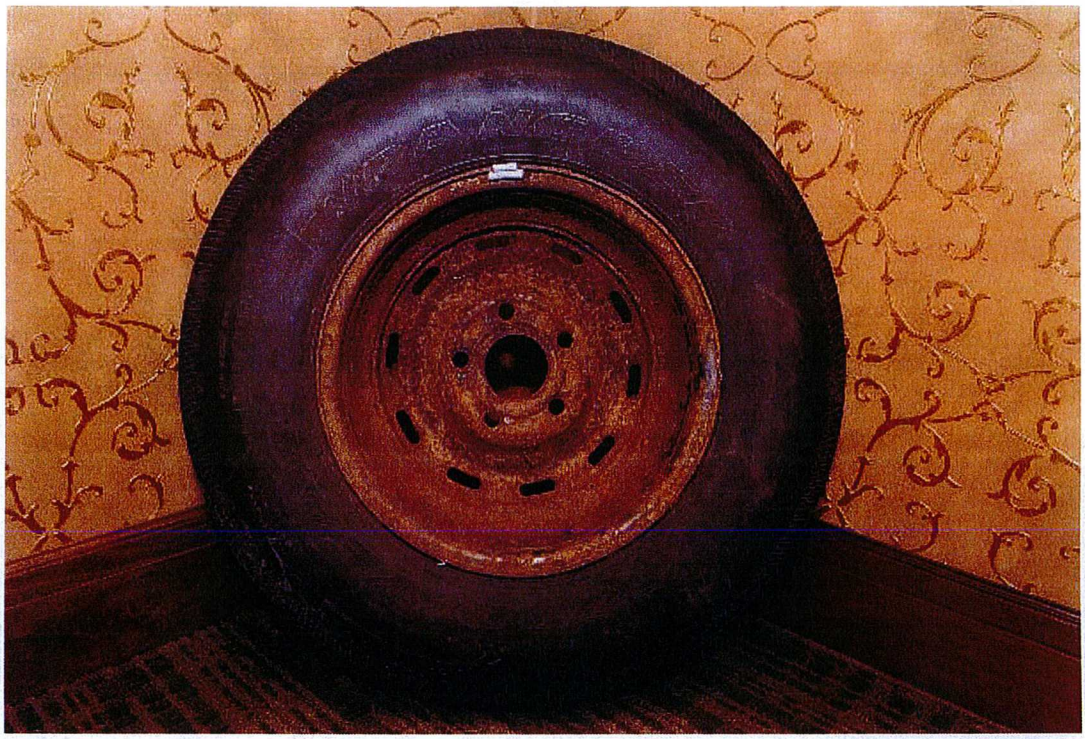

Figure 5. Rear side of the wheel and tire that reportedly detached from the subject vehicle.

Two wheel weights were observed installed on the inspected wheel. Both wheel weights are attached to the wheel using MC style clips, Figure 6. The wheel weight installed on the rear side of the wheel has the following markings: "*10 MC 28*". This indicates that this wheel weight weighs one (1) ounce or twenty-eight (28) grams, and uses MC style clip for wheel attachment. The markings on the wheel weight installed on the front side of the wheel state: "*1.5 MC 43*". These markings indicate that this wheel weight weighs one-and-a-half (1.5) ounces or forty-three (43) grams, and that it also uses MC style clip for wheel attachment.

The appearance of the wheel weights attached to the inspected wheel indicates that they were not in service or attached to the corroded wheel for a prolonged time. Both wheel weights appear clean with virtually no damage or material degradation. In addition, their appearance indicates that they were made from a compliant material such as lead or zinc. However, it is important to note that neither wheel weight has any markings that would signify material of construction, which is typical for wheel weights made from zinc or steel. For example, the zinc wheel weight would have a "ZN" mark on it. Based on the information gathered to date, typical industry

practice is to not provide material designation for the wheel weights made from lead. In addition, the information gathered to date indicates that the subject wheel weights were made from lead and were manufactured by Perfect Wheel Weight, which is owned by Wegmann Automotive. According to the information gathered to date, Wal-Mart stopped purchasing wheel weights made from lead in 2004, approximately 10 years before the subject incident. The wheel weights that FFESC received from Wal-Mart are not similar to the wheel weights found on the inspected wheel. The comparable Wal-Mart wheel weights are steel weights coated in plastic (so called Plasteel wheel weights) manufactured by Plombco, Figure 7.

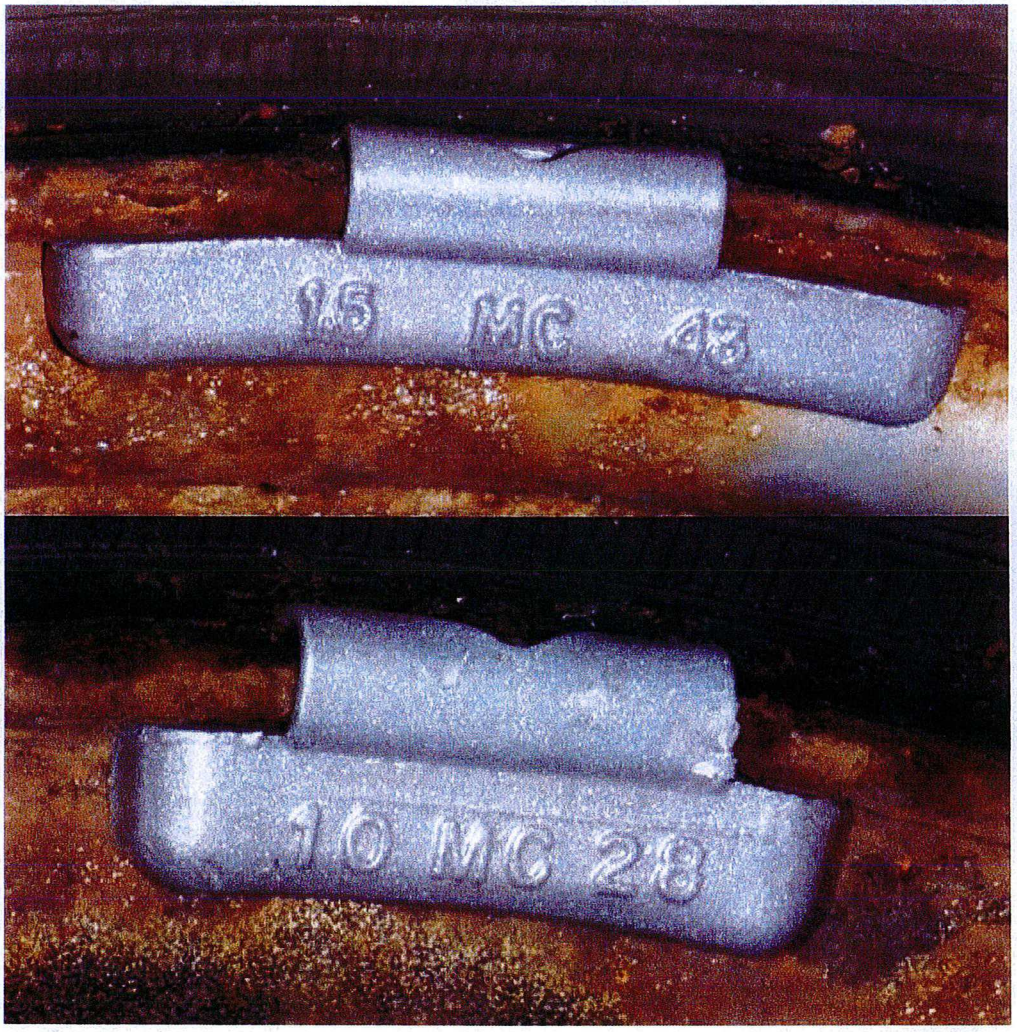

Figure 6. Wheel weights observed on the inspected wheel (top: front side of the wheel; bottom: rear side of the wheel).

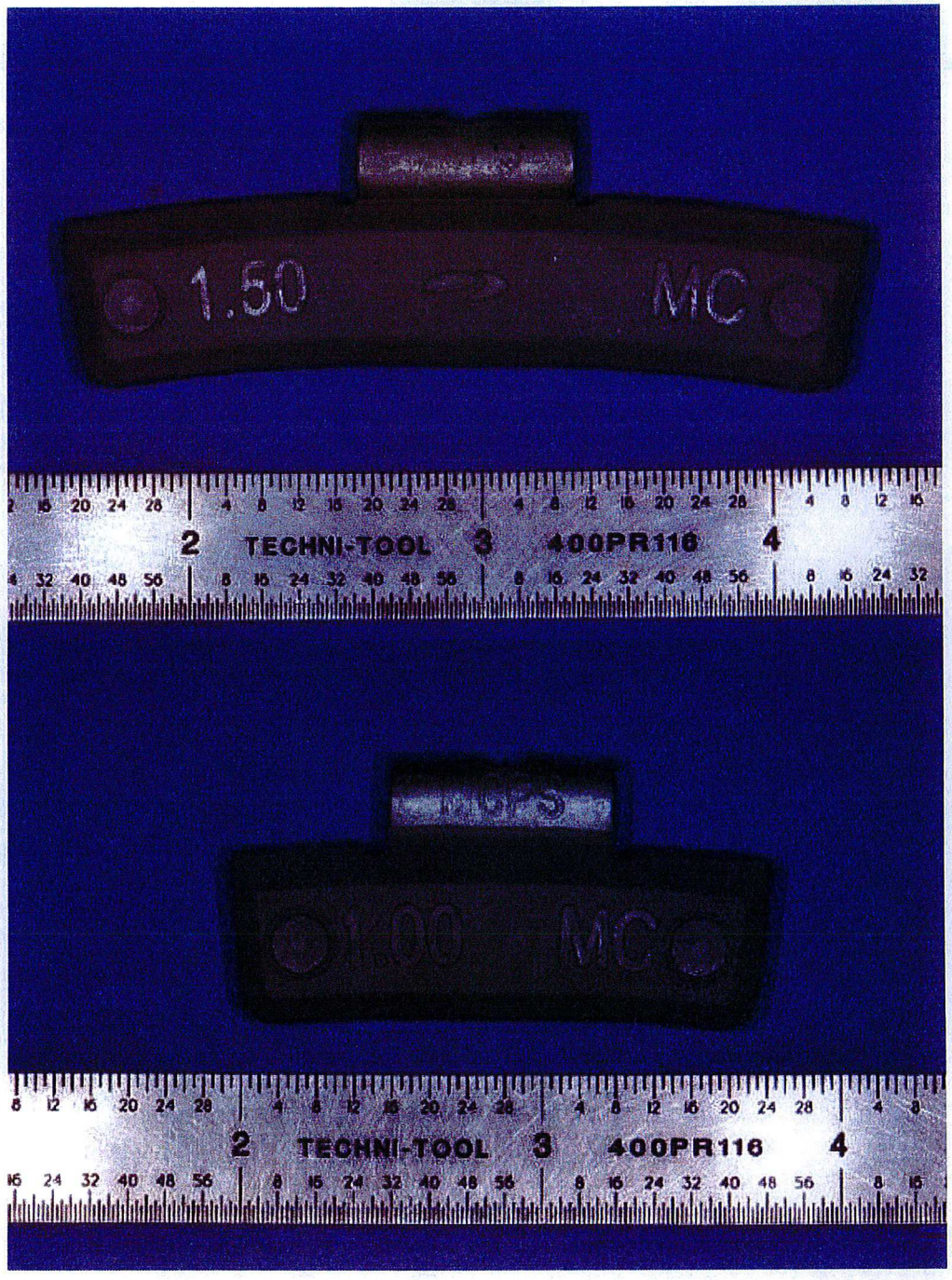

Figure 7. Wheel weights received from Wal-Mart. These weights are made from steel coated in plastic (Plasteel), and were manufactured by Plombco.

Circumferential witness marks were observed on the internal surface of the wheel rim, Figure 8. These marks are consistent with the rotor contacting the internal surface of the wheel rim as the wheel detached from a vehicle. Additional witness marks consistent with the wheel detachment were observed in the lug nut holes on the wheel itself. The surfaces of the lug nut holes have distinct thread imprints from contact with the studs, Figure 9. This contact is only possible if the lug nuts loosen sufficiently to allow the wheel to ride on the stud threads.

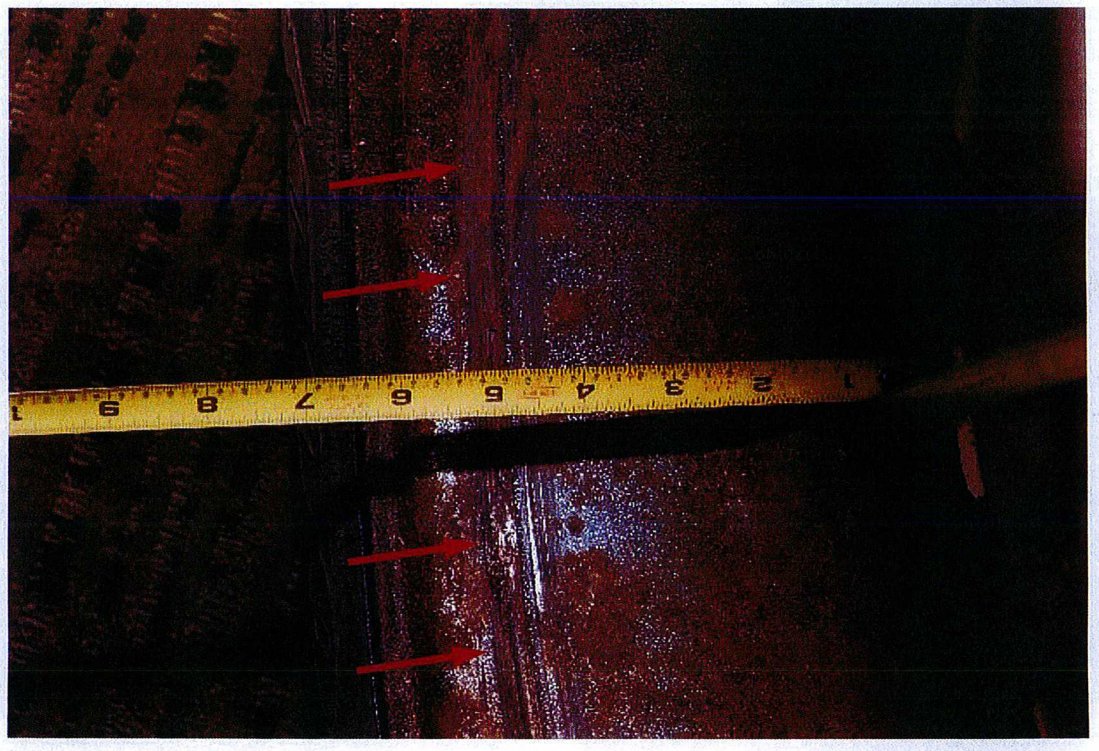

Figure 8. Witness marks observed on the internal surface of the wheel rim consistent with rotor contact.

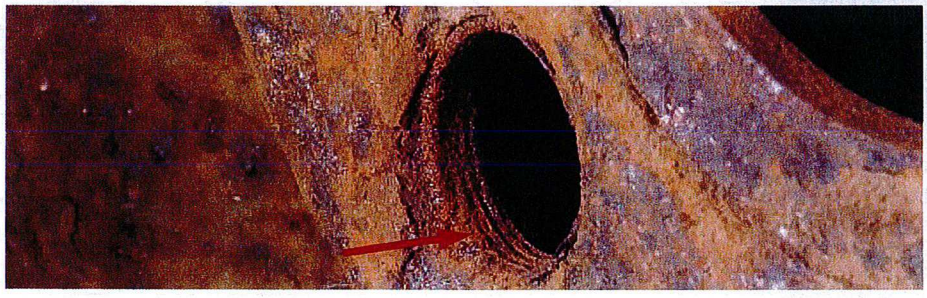

Figure 9. Witness marks observed on the internal surfaces of the lug nut holes consistent with stud thread contact.

The size of the tire found attached to the inspected wheel is LT215/85R16, which is a light truck tire 215 millimeters (8.46 inches) wide. The tire size designation also indicates that its sidewall height is 85% of the tire width, or 7.17 inches. This results in the overall tire and wheel assembly diameter of 30.4 inches, and a circumference of 95.47 inches. As compared to the size of the tire that Ms. Anderson purchased at Wal-Mart on December 7, 2014, which was then installed on the right front of the subject truck, the inspected tire is 1.25 inches smaller in diameter, or 0.63 inches in radius. The resulting difference in revolutions per mile of each tire is significant. According to the service manual for the 1998 Dodge 1500 pickup truck, the purchased tire has a nominal rating of approximately 660 revolutions per mile, while the inspected tire has a nominal rating of approximately 683 to 687 revolutions per mile. Based on the tire and wheel sizes alone FFESC computed that the 265/75 tire would rotate 637 times per mile traveled, while the 215/85 tire would rotate 663 times per mile traveled. In addition, the difference in circumference between these two tire sizes is almost four (4) inches nominally.

Typically, it is recommended to have tires of identical size installed on the same axle. In that configuration, consideration would be given to the differences in tread depth. In general, the tread depth difference above approximately three-thirty-seconds (3/32") of an inch is considered excessive in this configuration. In case that the two tires on the same axle have different dimensions, it is recommended that their circumference is not greater than approximately one-half (1/2") of an inch. Although various manufacturers provide various guidelines with respect to the differences in circumference, diameter, or tread depth for the tires installed on the same axle, when compared to any guideline the observed difference in circumference between the purchased and inspected tires is excessive, and could have significant detrimental effect on vehicle components.

The inspected tire tread pattern is consisted of two main circumferential rain grooves and a narrow center circumferential groove, while the tire shoulder consists of a solid circumferential track with transverse grooves that penetrate only partially into the solid circumferential track, Figure 10. The observed tread pattern on the inspected tires is significantly different from the tread pattern of the spare tire that was rolled from the rear of the subject vehicle to the front (Figure 1). The tread pattern of the inspected tire is also significantly different from the tire that was installed on

the vehicle as observed in the surveillance video (Figure 2), as well as from the tire track left by the left front tire as the vehicle was reversed out of the service bay (Figure 3).

The corrosion pattern on the front side of the wheel around the center bore is approximately uniform around the center bore hole (Figure 4). In addition, the corrosion of the wheel is significantly more pronounced on its rear side than on the front. This is not consistent with the spare wheel being suspended under the vehicle for a prolonged time.

The front side of the wheel is pulled underneath the rear of the truck using a rectangular clip and cable mechanism, Figure 11. In this configuration, the front side of the wheel is facing the roadway and would be subjected to the corrosive media, while the rear side faces away from the roadway and would be somewhat protected from interacting with the corrosive media splashing from the roadway. In addition, the appearance of the inspected wheel is not consistent with the appearance of the wheel that was rolled in the surveillance video from the rear of the subject truck.

In the spare tire storing configuration, the contact between the rectangular clip and the front side of the wheel would protect the portion of the wheel surface in contact with the clip from being exposed to the corrosive media. The lack of the corrosion pattern signifying the location of the rectangular clip, and the more pronounced uniform corrosion on the rear surface of the wheel, indicate that the inspected wheel was not stored as a spare for a prolonged time.

Similarly, when the spare tire is stored under the vehicle, the tire interacts with two transverse frame rales located underneath the cargo bed, Figure 11. The two frame rails typically result in the tire sidewall indentation when the spare tire is stored underneath the vehicle for a prolonged time. The inspected tire did not exhibit witness marks consistent with indentation resulting from interaction with the frame rails. This also indicates that the inspected tire was not stored underneath the vehicle for a prolonged time.

Figure 10. Tread pattern on the inspected tire. Note, that the transverse grooves only partially penetrate the tire shoulder tread pattern, and do not separate the tire shoulder tread into separate blocks.

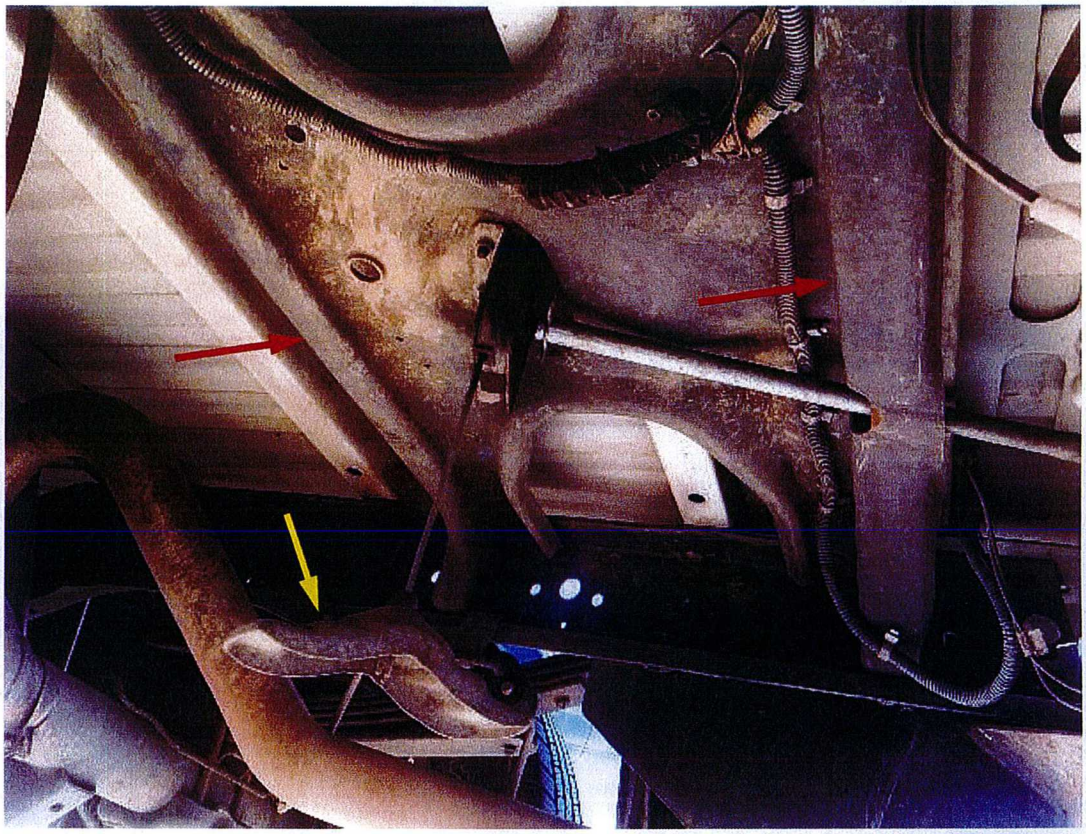

Figure 11. Spare tire mechanism on a 2001 Dodge 1500. Note the rectangular clip (yellow arrow), and the transverse frame rails (red arrows).

The inspected tire was tested to evaluate its tread pattern track. The tire was wetted and rolled over the painter's paper on which it left a track, Figure 12. The track left by the inspected and tested tire consisted of two (2) circumferential rain grooves, narrow center circumferential groove, and a solid shoulder trail on both sides. The test shows that the track left by the inspected tire is significantly dissimilar to the track left by the front left tire observed in the surveillance video. The test results indicate that the inspected tire is not the tire that was installed on the left front of the subject vehicle.

Figure 12. Tread track left by the inspected tire on the painter's paper. Note the solid shoulder track, as opposed to the block (patch) track observed in the surveillance video.

Conclusions

Based on the review of the surveillance video, the inspection of the produced tire and wheel, the review of testimony, documents and images, the information gathered to date, and my engineering analysis, I have reached the following conclusions and hold each to a reasonable degree of engineering certainty:

1. Based on the damage observed on the inspected wheel, this wheel likely detached from a vehicle. In addition, the damage indicates that the detachment occurred in two stages: brake rotor contacting the internal rim surface of the wheel, followed by the rotor dropping to the pavement.

2. Based on the review of subject truck images taken after the incident, Ms. Anderson's testimony, and the inspected wheel damage, the inspected wheel likely detached from the subject vehicle.

3. Based on the evidence evaluation and information gathered to date, the wheel weights found attached to the inspected wheel were made from lead.

4. Based on the information gathered to date, Wal-Mart stopped purchasing lead wheel weights in 2004, approximately ten (10) years before servicing Ms. Anderson's truck. In addition, based on their appearance, the wheel weights produced by Wal-Mart, which are made from steel coated in plastic, are not similar to the weights found attached to the inspected wheel. Therefore, it is unlikely that Wal-Mart installed the wheel weights found attached to the inspected wheel.

5. Based on the surveillance video review, and inspection of the produced wheel and tire, the inspected wheel was likely not the spare wheel that was removed from the subject vehicle at the time of Wal-Mart's service.

6. Based on the information obtained from the surveillance video, the information gathered to date, and evidence evaluation and testing, the inspected tire was not the tire that was installed on the subject vehicle at the time of Wal-Mart's service on December 7, 2014.

7. Based on the evidence evaluation and information to date, the tire and wheel installed during the Wal-Mart's service performed on December 7, 2014, were removed from the hub assembly prior to the subject incident that occurred on December 14, 2014.

8. Based on the evidence evaluation and information gathered to date, the inspected wheel and tire were installed on the subject vehicle after the Wal-Mart's service performed on December 7, 2014.

9. Based on the surveillance video review, Wal-Mart torqued the lug nuts on the front left of the subject vehicle three times. This is consistent with the testimony of Mr. Perleberg and Mr. Patek regarding the Wal-Mart's lug nut tightening protocol

10. Wal-Mart's lug nut tightening procedure, which results in the lug nuts being torqued three times, is conservative and above standard of care when compared to the industry typical single torqueing application.

11. There is no evidence to conclude that Wal-Mart performed installation of the left front wheel on the subject truck inappropriately.

12. Evidence evaluation indicates that the inspected wheel and tire were not likely stored as a spare for a prolonged time.

Should additional information become available, FFESC reserves the right to supplement, amend or modify this report.